

Title: Shish Kebabs

Brief Overview:

This unit provides students with an application of patterning.

Students will:

- use a variety of materials to copy, continue, and create patterns.
- describe patterns using the A, B, C method.
- build patterns when given a description.
- create a variety of edible shish kebabs for a luau as a culminating activity.

Students will be presented with the following scenario:

- A new student is coming from Hawaii.
- Class receives a letter from the principal.
- Class will welcome the new student by planning a luau.
- Class will be responsible for the food.
- Students will be divided into groups for appetizers, main course, dessert, and decorations if needed.
- Each group will be responsible for making two different patterns for their kebabs.
- Choose a day for the luau. On that day actually make shish kebabs in cooperative learning groups.

Link to Standards:

- **Problem Solving** Students will demonstrate their ability to solve mathematical problems through the use of open-ended answers and a cooperative atmosphere.
- **Communication** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.
- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.
- **Patterns** Students will demonstrate their ability to recognize numeric and geometric relationships and will generalize a relation from data. This includes creating and explaining a pattern, and recognizing, describing, and extending a pattern.

Grade/Level:

Grades 3/4

Duration/Length:

This lesson will take 2 weeks (45 minute periods).

Prerequisite Knowledge:

Students should have working knowledge of the following:

- Sequential order
- Logic activities
- Deductive and inductive reasoning
- Computations (addition or multiplication)
- Completion of charts/tables

Objectives:

Students will be able to:

- work cooperatively in groups.
- copy and continue patterns
- build patterns with same materials and different materials
- generalize a pattern rule
- make and support predictions

Materials/Resources/Printed Materials:

These are suggested materials. You may use any similar type of items to create shish kebabs.

- Shish kebab items - Fruit Loops cereal, Lifesavers, gumdrops, Runt candy, colored miniature marshmallows, marshmallow peanut candies, pictures of food, unifix cubes, keys, links, pattern blocks, soda tabs, or bread tabs, Teacher Resource #5, etc.
- Skewer materials - bamboo skewers, toothpicks, straws, coffee stirrers, pipe cleaners, pencils, string licorice, sentence strips, popsicle sticks, or string
- Paper towel roll
- Variety of fruits, vegetables, meats, brought in by class, to be used in extension activity
- Latex gloves for handling food
- Glue
- Ziplock bags
- Masking tape
- Teacher Resources 1-5

Development/Procedures:

Activity 1: ESTABLISH SCENARIO

- Read letter from principal (Teacher Resource #1) to class.
- Discuss the following questions with class:
What do you know about Hawaii? (Be sure to include in the discussion where Hawaii is located, it is an island state, it is part of the U.S.A.)
- Compare and contrast Hawaii to the state where you live.
- Discuss what is a luau and what is a shish kebab.

Activity 2: COPY PATTERNS

- Distribute some Fruit Loops cereal or Lifesavers and a coffee stirrer (or other similar shish kebab materials) to each student.
- Arrange cereal or candy on coffee stirrer in a simple, A,B, A, B pattern. Show to students and direct them to copy pattern. Students check their patterns with a partner. Continue making patterns increasing the difficulty of each pattern. For example, the second pattern could be A, A, B, A, A, B; the next A, B, C, B, A, B, C, B; etc.
- Continue until the students have grasped copying patterns.
- Work in pairs. One student creates a pattern, and the other copies partner's pattern. Then, exchange roles.
- Eat materials!

Activity 3: CONTINUE PATTERNS

- Distribute gumdrops and toothpicks (or other similar materials).
 - Arrange two core patterns using gumdrops on toothpicks. For example, A,B,B,A,B,B....
 - Students continue pattern with their gumdrops and toothpicks.
 - Students hold up patterns. Ask students to look to see if their pattern matches everyone else's.
 - Continue making a variety of more complex patterns, such as A,A,B,C,C,A,A,B,C,C... and students continue the pattern with their materials.
 - Divide students into groups of three. Assign each student a number 1, 2 or 3. Write on the overhead the following job assignments:
 - #1: Create a pattern
 - #2: Continue the pattern
 - #3: Check #2's work
- Rotate jobs so each student has a chance to do every job.
- With class, list on chart paper everything they now know about patterns. Keep this displayed in the classroom.

Activity 4: BUILD PATTERNS (Same pattern, different materials)

- Distribute leftover gumdrops, cereal, Lifesavers, toothpicks, Runts, coffee stirrers etc. to students. (Could also use any other type of materials such as unifix cubes, etc.)
- Students sort materials.
- Distribute sentence strips, one to each student.
- Draw five squares on the overhead and label squares A, B, C, D, and E. Have students copy this on their sentence strip. Place a different object on each square.
- Students pick five different objects, placing one on each square labeled A, B, C, D, and E.
- Tell students to leave objects on the lettered squares.
- Model the making of a pattern following these instructions:
 - a. Put an A piece on a skewer (coffee stirrer, toothpick, etc.).
 - b. Hold up the kebab and say "A."
 - c. Put another A piece on the skewer
 - d. Hold up the kebab and say "A,A."
 - e. Put a B piece on the skewer
 - f. Hold up the kebab and say "A,A,B."
 - g. Put a B piece on the skewer
 - h. Hold up the kebab and say "A,A,B,B."
 - i. Put an A piece on a skewer.
 - j. Hold up the kebab and say "A,A,B,B,A."

- k. Put another A piece on the skewer.
- l. Hold up the kebab and say "A,A,B,B,A,A."
- m. Put a B piece on the skewer.
- n. Hold up the kebab and say "A,A,B,B,A,A,B."
- o. Put a B piece on the skewer.
- p. Hold up the kebab and say "A,A,B,B,A,A,B,B."
- q. Hold up a pre-made sentence strip showing the pattern A,A,B,B,A,A,B,B.
Explain process to students.
- Tell students to use their materials to make an A,A,B,B,A,A,B,B pattern.
- Repeat process using other sentence strips with various patterns.

Activity 5: CREATE PATTERN, GENERALIZE THE RULE (Same material, different rule)

- Distribute Runtts, popsicle sticks, (or other similar materials) and glue.
- Model the creation of a pattern using Runtts glued onto a popsicle stick.
- Students create their own patterns by gluing Runtts to their stick.
- Ask for a volunteer to show their pattern to the class.
- Tape pattern to chart paper/blackboard, etc. This will be the first pattern category.
- Ask if anyone thinks their pattern matches this pattern.
- Collect these one at a time.
- Ask students to show thumbs up if they think the patterns match, thumbs down if they think they don't. (Teacher create new categories as needed.)
- Continue until all popsicle sticks are displayed on the chart/board.
- Have students describe each pattern within a category. For example, a student response might be, "banana, orange, grape, banana, orange, grape...." Say to the class, "This is taking a loooong time! Can anyone describe them another way?" Lead students to recognize the pattern A,B,C,A,B,C.

Activity 6: SEE PATTERN AND MAKE PREDICTIONS

- Before class, make a kebab using a variety of colors of marshmallow peanuts candy (or other similar materials) to show an A,B,A,C pattern.
- Write on board "term" and "core" and define. (TERM - a single element in the pattern; CORE- shortest string of terms that repeat, the core is always fully repeated and never only partially shown)
- Put the kebab made above into a paper towel roll.
- Slowly pull kebab from roll to display the first term of the pattern. Continue to reveal each marshmallow until five pieces (A,B,A,C,A) are showing.
- Ask students to think about what the 17th term will be.
- Students should then write what their prediction is and explain how they came to that conclusion. Share with a partner. Ask for volunteers to share their writing and discuss.
- Reveal the next term and discuss their predictions.

Activity 7: PROBLEM SOLVING

- Divide class into cooperative learning groups of 4.
- Give each group a set of cards (Teacher Resource #2).
- Each student in the group gets 1 card from the set. Each student reads his/her card aloud to the group. Group decides how to construct a kebab that meets all criteria.
- Students use a variety of materials from previous activities to make kebabs as directed on the cards.

- When a group has completed a set, teacher checks them and gives them another set to complete.
- Give each group a set of blank cards. Have the group make their own problem on the cards.
- Send-a-Problem (exchange cards among groups and solve).

Activity 8: PERFORMANCE ASSESSMENT

- Distribute Teacher Resource #3.
- Read student worksheet with class, ask for any questions. Then, students complete performance task.
- Use scoring key (Teacher Resource #4), or make your own key, to assess student progress.
- Here are three possible patterns for Maya's kebabs:
 A = Banana B = Orange C = Grape
 1. A,A,A,B,C,B,A,A,A,B,C,B...
 2. C,B,A,A,A,B,C,C,B,A,A,A,B,C...
 3. B,C,B,A,A,A,B,B,C,B,A,A,A,B...
- NOTE: A 4 on the scoring key represents an exemplary answer.

Extension/Follow Up:

- Have a real "luau" with your class. Choose a date for the party. On that day, have students bring in food items to make shish kebabs. Break students into four groups: appetizer kebabs, main course kebabs, dessert kebabs, and decoration kebabs. Each group is responsible for making enough shish kebabs for the entire class. Make sure students design kebabs following patterns.
- Computer program "The Pond" by Sunburst

Extended Resources

- Cooperative Problem Solving with Pattern Blocks
Creative Publications
- Patterns and Functions: Kindergarten through Grade Nine
Hands On, Inc. (Historical Note: Leonardo Fibonacci was a mathematician during the 12th century who discovered a pattern of numbers that occurs in nature. See page 140 for a Fibonacci activity.
- Web sites: <http://babe.math.uic.edu/oakpark/district97/integrate/patterns/math3.html>
<http://nde4.nde.state.ne.us/NMSI/mathvantage/patterns/>
<http://nde4.nde.state.ne.us/NMSI/mathvantage/patterns/mvpatunit.html#discover>
<http://oz.plymouth.edu/~mathdept/curricula/46pat> NH 4-6 Math Curriculum Addendum - Patterns With Fractals

Professional Resources

- Assessment Standards for School Mathematics
NCTM
- Curriculum for Evaluation Standards for School Mathematics
NCTM

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TEACHER RESOURCE #1

Dear Students,

Congratulations! Your class has been selected as the host class for a visiting student named Maya. She is a fourth grader from Hawaii and will be visiting your class to study more about the state of _____.

To welcome your new friend your teacher, _____, has asked me for permission to hold a luau. You are in charge of this celebration. Please plan the party. You may make shish kebabs, have decorations, and play games.

I know you will make Maya welcome in your classroom. Have fun planning your luau. Enjoy your party and don't forget to send me an invitation.

Sincerely,

Your principal

SET ONE

On one skewer
create a repeating
pattern.

SET ONE

Use at least 3
different items.

SET ONE

No like items may
be next to each
other.

SET ONE

Repeat each core
pattern four times.

SET TWO

On one skewer,
create a repeating
pattern.

SET TWO

Repeat each core
pattern at least five
times.

SET TWO

Put at least 2 of the
same items
together.

SET TWO

Use no more than
20 items.

SET THREE

Make a line of
items in a
repeating pattern.

SET THREE

Use three different
kinds of items.

SET THREE

Use twice as many
greens as reds.

SET THREE

No red item may
be next to a green
item.

SET FOUR

Make a line of
items in a
repeating pattern.

SET FOUR

Use more orange
items than any
other color.

SET FOUR

Use four different
colors in the
pattern.

SET FOUR

Start the pattern
with an orange
followed by a red.

SET FIVE

Make a line of
items in a
repeating pattern.

SET FIVE

Use two different
kinds of items.

SET FIVE

Put 2 of the same items next to each other in the pattern.

SET FIVE

Extend the pattern to use 12 items in all.

SET SIX

On a skewer, create a repeating pattern.

SET SIX

Start the pattern with 2 orange items.

SET SIX

Use at least 5 different colored items.

SET SIX

Extend the pattern across your work area.

SET SEVEN

On one skewer,
create a repeating
pattern.

SET SEVEN

Extend the pattern
to use 20 items in
all.

SET SEVEN

Use more blue
items than any
other color.

SET SEVEN

Do not use any red
items.

SET EIGHT

Make a line of
items in a
repeating pattern.

SET EIGHT

Begin the pattern
with 3 of the same
items.

SET EIGHT

Use 7 items in the
core pattern.

SET EIGHT

Use twice as many
blue items as
green.



(Blanks for student-generated cards.)

Name _____

TEACHER RESOURCE #3

Performance Assessment

PART A

You are making a fruit kebab for Maya. She only likes bananas, oranges, and grapes. She does not like her grapes to touch her bananas, and she really, really, loves bananas! Using all three fruits, make one patterned fruit kebab for her. Repeat each pattern at least twice.



Name _____

Performance Assessment

Part B

Predict what the 23rd item/term will be. Convince Maya that this item/term is correct.

SCORING KEY

Part A

- 3**
 - Meets all criteria.
 - Repeated pattern at least two times.
 - Bananas are not next to the grapes.
 - Used more banana than any other fruit.

- 2**
 - Meets 2 of the 3 criteria.
 - Repeated pattern at least two times.
 - Bananas are not next to the grapes.
 - Used more bananas than any other fruit.

- 1**
 - Meets 1 of the 3 criteria.
 - Repeated pattern at least twice OR bananas are not next to the grapes OR used more bananas than any other fruit.

SCORING KEY

Part B

- 4** • Predicted the 23rd item and fully supported prediction with reasons.
 - Writing included at least one of the following: chart, table, picture, diagram and labels.
- 3** • Predicted the 23rd item and somewhat supported prediction with reasons.
 - Writing included at least one of the following: chart, table, picture, diagram and may or may not have included labels.
- 2** • Predicted 23rd item but did not support prediction, or
 - Prediction is incorrect but is supported by reasons.
- 1** • Predicted 23rd item.

TEACHER RESOURCE #5

